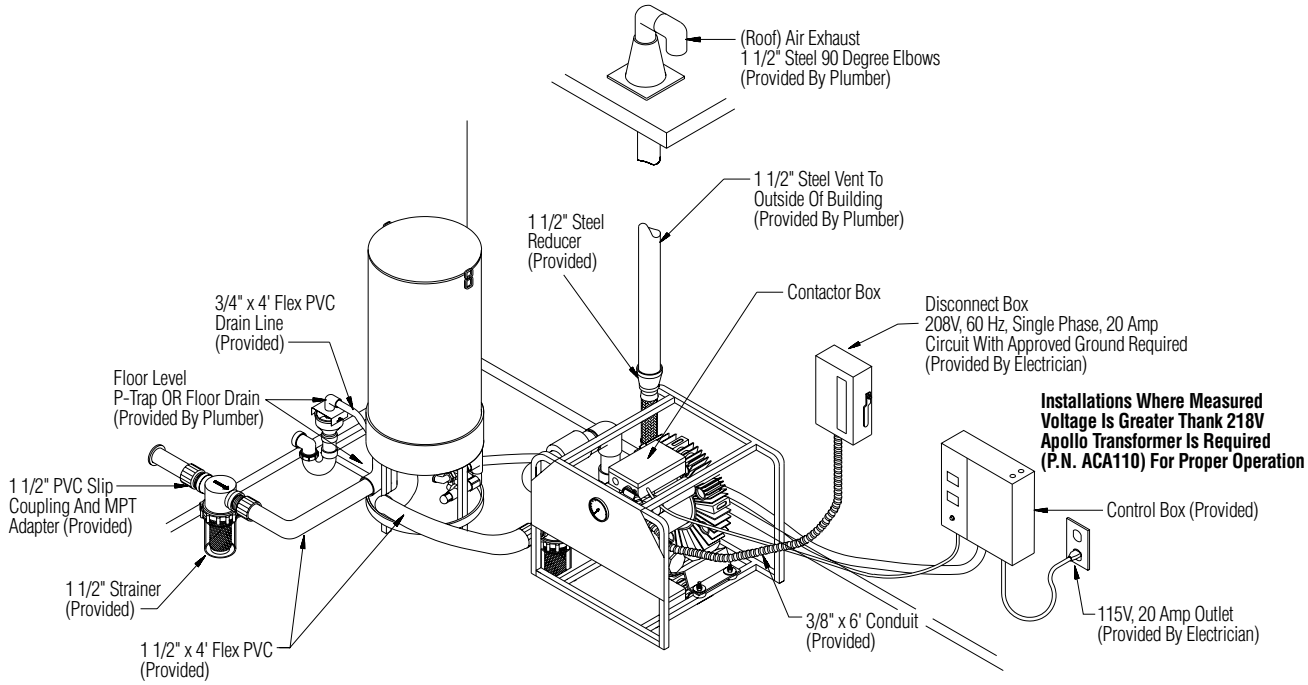
Installation & Operation

AVD4S Single DryVac™ Vacuum System



Description:

Apollo Dental Products' Vacuum Systems have been tested and approved by various regulatory test agencies. The following list contains ADP File Numbers that may be helpful if questions arise regarding installation inspections.

Underwriter's Laboratories (UL) (cUL) ..... File Number: MH13627
U.S. Food and Drug Administration (FDA) ..... File Number: 2937927
City of Los Angeles Mechanical Test Labs ..... File Number M880066

Important: This dental vacuum system should only be installed by qualified personnel. Should any questions arise during the installation, call Apollo Dental Products Technical Support between the hours of 6:00 a.m. to 4:00 p.m. (Pacific Standard Time).

Unpacking The System:

Place the vacuum system in a clean, dry, well ventilated area, on a solid, level surface. Consider sound level and insulate as needed. Be sure that adequate ventilation is available as the vacuum system is air-cooled. Ambient temperature in the equipment room should be within the temperature range of 40 degrees Fahrenheit (4º C) minimum to 100 degrees Fahrenheit (38º C) maximum. **Do Not Allow The Vacuum To Freeze.**

1. Remove the cardboard from the shipping platform.
2. Inspect unit for damage and that the Vacuum Installation Kit is in the box.
3. Remove the vacuum from the shipping platform.

Vacuum Pump Specifications:

IMPORTANT: All vacuum systems are to be installed according to local plumbing and electrical codes. Never operate the equipment without complete and proper grounding.

A. Electrical Hook-Up Requirements:

Model	Max. Users	Max Mercury	HP	Volts	Amps	Circuit Breaker	Width	Depth	Height	Weight
AVD4S	4	10"	1.75	208	10	20	45"	18"	36"	185lbs.

Low Voltage Line (24V)

Run 18-3 Thermostat wire from each remote control switch if low voltage remote control switching is desired. **Red** and **Blue** wires are for switching, the **White** wire is for a lighted switch.

Line Voltage (60 Hz)

Single-phase, 208 volt, 60 Hz, protected supply circuit with approved disconnect and ground connection is required.

B. Plumbing Hook-Up Requirements (See Illustration on Page 1):

Waste Line (Drain)

Liquid waste exhaust to sewer terminating in:

Option A - Floor sink.

Option B - P-trap adapted to 3/4 inch (19mm) PVC slip connection. A 1 inch (25mm) air gap may be required by local code.

Vacuum Line (Do Not Cement)

1 1/2" PVC female slip connection.

IMPORTANT: Continuously running sinks or cuspidors must NEVER be connected to the vacuum piping system. Serious damage may result.

Vent Line

1 1/2" galvanized steel to roof. Isolate vent line to minimize sound transmission through walls.

***It is normal for this line to be hot.**

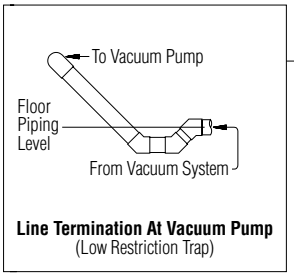
C. Vacuum Piping System Guidelines:

The design of the vacuum piping can have a large effect on the efficiency and reliability of the dental vacuum system. Experience has shown that the most effective vacuum piping designs are based on the air velocity that will occur in the lines. The velocity must be high enough to entrain all liquids and sediment in the air flow so that they do not accumulate in the lines. At the same time; the velocity must not be so high as to cause unacceptable vacuum losses. The Vacuum Line Sizing chart on the following page is based on maintaining an optimum air flow velocity according to the criteria described above.

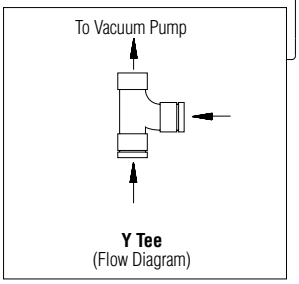
D. Vacuum Line Sizing Chart:

Number Of Operatories Supplied Through Line	Pipe Diameter In Inches (MM)
1	3/4" (19)
2	1" (25)
3	1" (25)
4	1 1/4" (32)

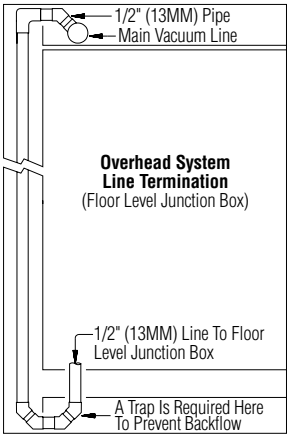
NOTE:
Use the number of operatories being supplied, not the number of outlets within the operatories, to determine line size at any given point. Branch lines to individual operatories off of the main suction line should be 3/4 inch pipe. Overhead branch lines require 1/2 inch pipe to the individual operatories.



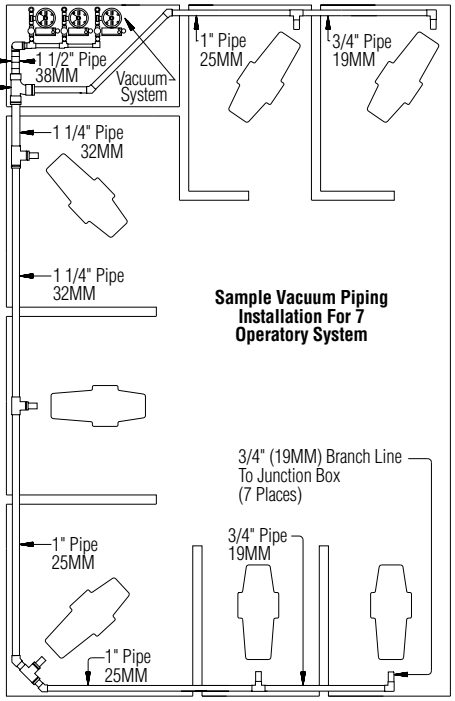
Line Termination At Vacuum Pump
(Low Restriction Trap)



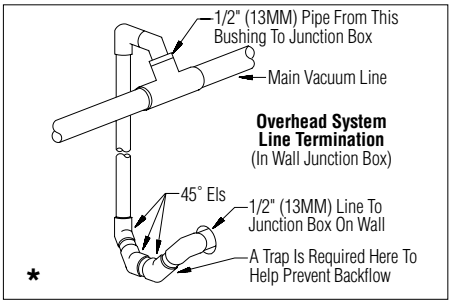
Y Tee
(Flow Diagram)



Overhead System Line Termination
(Floor Level Junction Box)



Sample Vacuum Piping Installation For 7 Operatory System


1/2" (13MM) Pipe From This Bushing To Junction Box
Main Vacuum Line
45˚ Els
1/2" (13MM) Line To Junction Box On Wall
A Trap Is Required Here To Help Prevent Backflow
*
Overhead System Line Termination
(In Wall Junction Box)

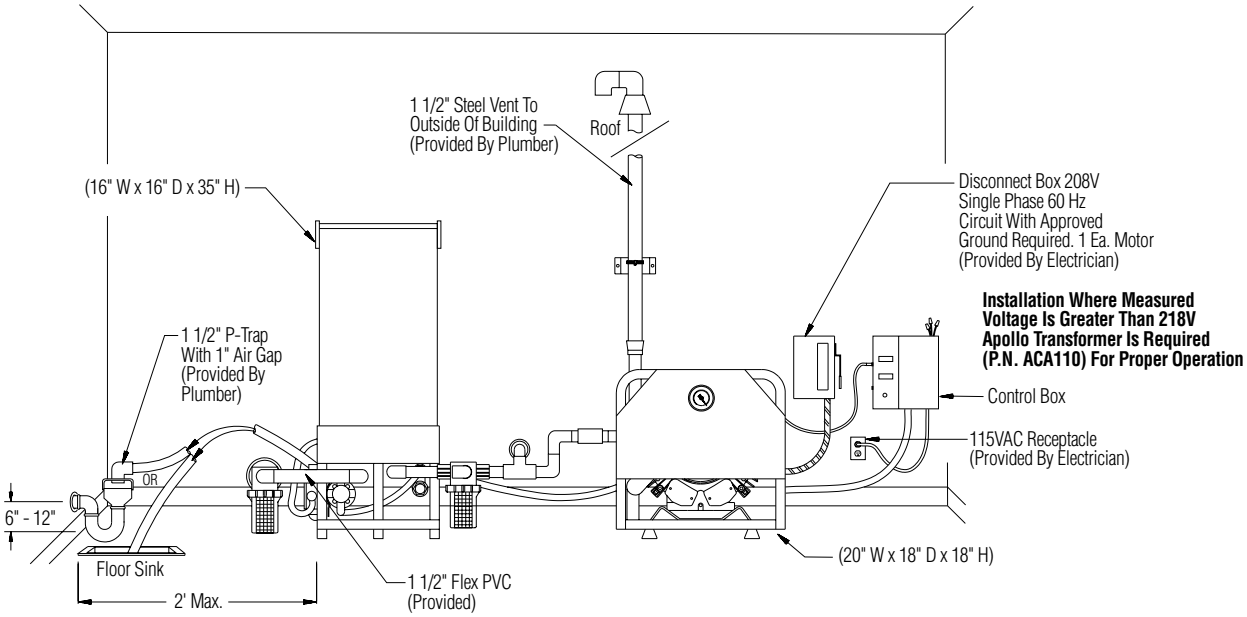
The vacuum lines should be supported to prevent sag and should be sloped 1/4 inch (6 mm) for every 10 feet (3m) towards the vacuum pump.

It is of primary importance to minimize 90 degree turns in the system. These will not only cause vacuum losses, but will also provide areas where sediment can accumulate. A combination of two 45 degree elbows are preferable to a 90 degree elbow. Restrictions in the line will also cause vacuum losses. Y-Tee fittings should be used whenever possible.

Overhead systems also require a 1/2 inch (13mm) line rather than 3/4 inch (19mm) from the operatories to the main line, and special provisions to ensure that liquids do not travel back into the operatories.
***See above illustration.**

A sample vacuum piping diagram is shown. Consult Apollo Dental Products Technical Support for further information regarding vacuum line sizing.

Typical Installation



E. Installing The DryVac 4 Vacuum System:

1. Place the vacuum unit on a solid level floor within 2 feet (0.6m) of waste line P-trap or floor sink.
   *Note: Drain must be below drain on Separation Tank.
2. Using 1 1/2 inch galvanized pipe, vent the exhaust air from the muffler to the roof of the building. Protect the vent from rain by terminating it with the PVC elbows pointing down.

   For public health, ventilation and cooling, the exhaust air must not be vented inside any building or upwind of any fresh air intake source.
3. Connect operatory vacuum line to the pump suction stainer using PVC pipe or the flex PVC provided. **Do not cement this suction hose.**
4. Attach provided 3/4 inch (19mm) drain hose to the unit using the provided union. Route to a floor sink or wall mounted P-trap. The bottom of the tank must be kept above the drain for proper drainage.
5. Connect the high voltage electrical supply line to a disconnect box provided by electrician.
6. For low voltage remote control, connect low voltage wires of corresponding color from the ADP Master Control Panel vacuum switch.

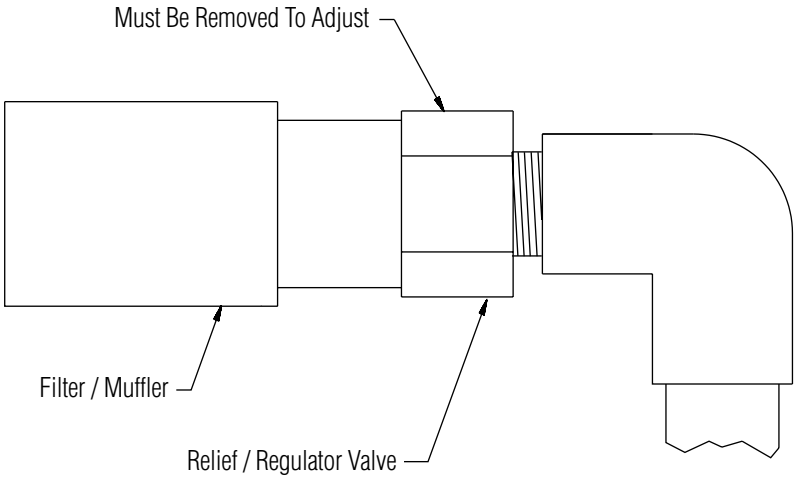
F. Initial Start-Up:

1. Start the vacuum.
2. Check the vacuum gauge to ensure that the unit is functioning properly. Vacuum is factory preset for 10 inches Hg (34 KPa) vacuum. If vacuum is low, check for leaks or open operatory lines.
3. Vacuum 1-2 gallons of water into the system.
4. Check for leaks.
5. Turn unit “OFF” and ensure that water drains freely from tank without leaks.
6. Store this manual for future reference.
7. Fill out Warranty Card and mail or fax to Apollo Dental Products within ten (10) days.

G. Vacuum Level Adjustment:

The vacuum level is adjustable in the range of 6 to 10 inches Hg (20 to 34 Kpa).

1. Remove the filter and valve from the PVC elbow.
2. Using a 1/4 inch socket and a phillips screwdriver adjust the center mounted screw within the valve. Each full clockwise turn increases the vacuum level by approximately 2 inch Hg.



MAINTENANCE:

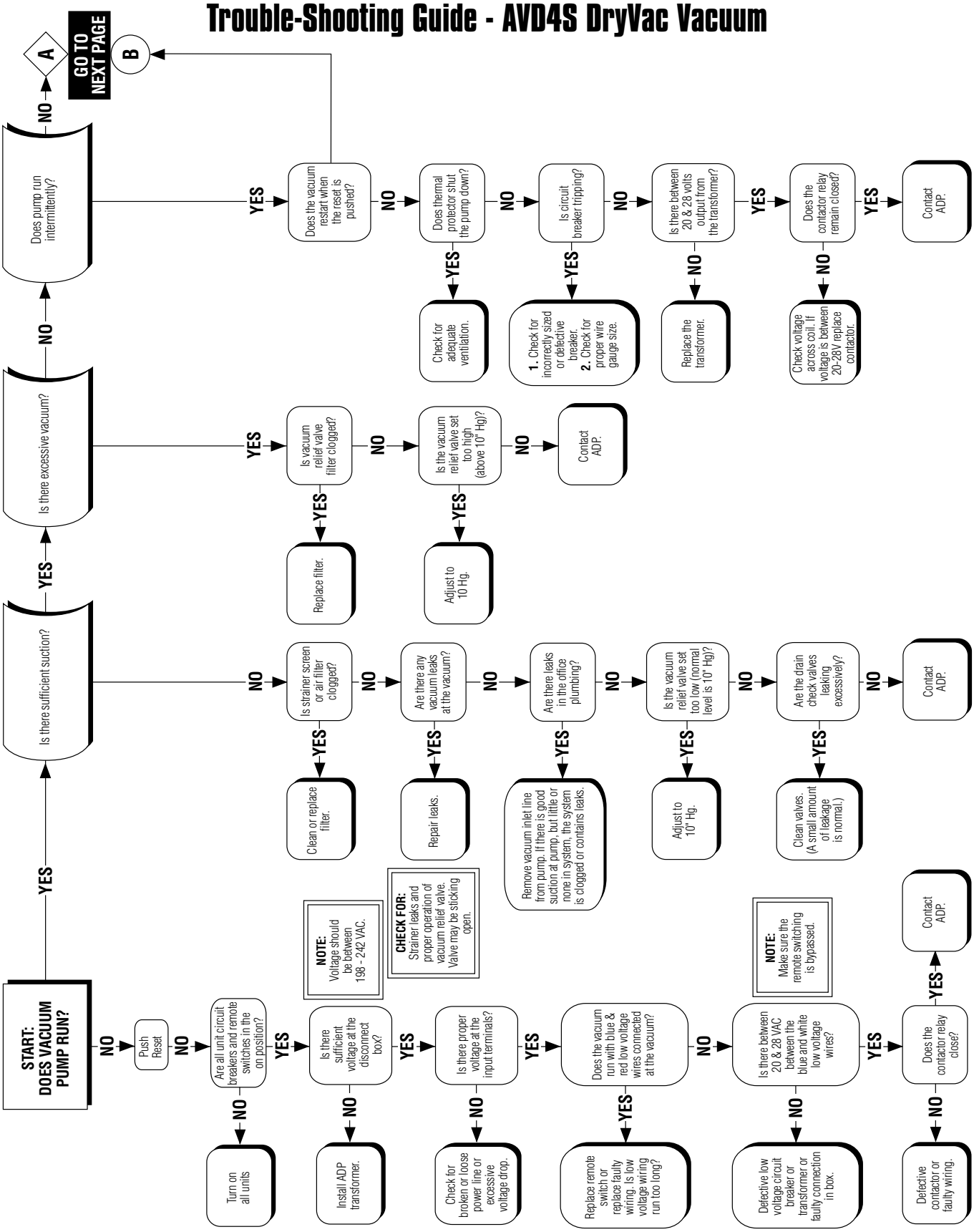
During the first week of operation the **vacuum intake strainers should be cleaned daily** in addition to cleaning the vacuum lines. After the first week the following maintenance schedule should be followed. Proper and diligent maintenance is a must for trouble free operation.

Maintenance Chart:

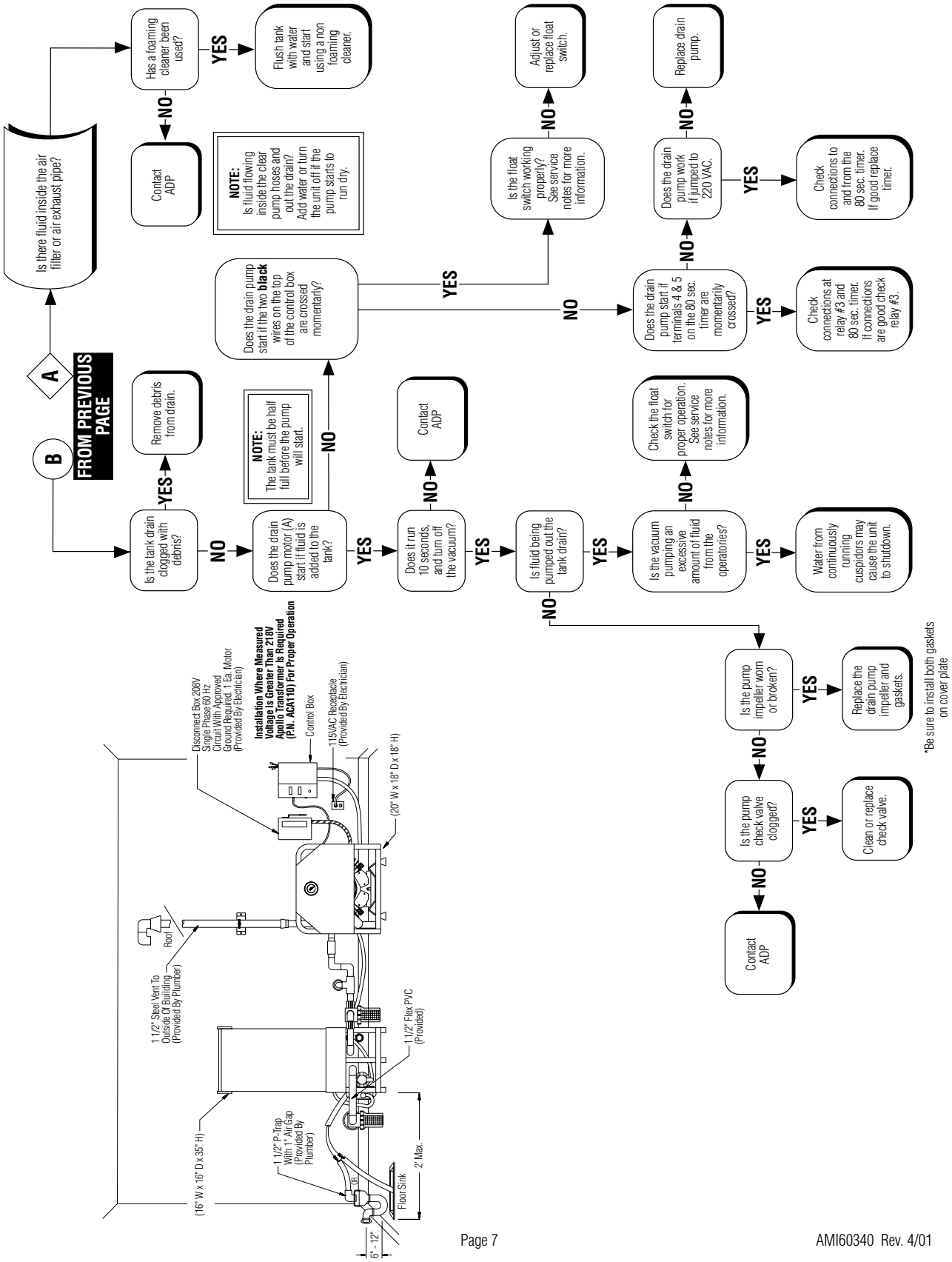
Maintenance Procedure	Daily	Weekly	Monthly	Semi-Annually	Annually
*Cleanse Vacuum Piping System	•				
Clean In-Operatory Strainers	•				
Clean Vacuum Pump Intake Filters		•			
Check Vacuum Level			•		
Clean And Dust Vacuum Pump				•	
**Replace Drain Pump Impeller and Gaskets					•
Clean or Replace Relief/Regulator Filter					•
Rinse Out Liquid Separator Tank					•

*Cleaner should be low foaming such as ADP StayClean™ Evacuation System Cleaner - Part #ASC00002
**Be sure to install both gaskets provided with the impeller.

Trouble-Shooting Guide - AVD4S DryVac Vacuum


START: DOES VACUUM PUMP RUN?
YES
NO
Push Reset
Are all unit circuit breakers and remote switches in the on position?
Turn on all units
Is there sufficient voltage at the disconnect box?
Install ADP transformer.
NOTE: Voltage should be between 198 - 242 VAC.
Is there proper voltage at the input terminals?
Check for broken or loose power line or excessive voltage drop.
Does the vacuum run with blue & red low voltage wires connected at the vacuum?
Replace remote switch or replace faulty wiring. Is low voltage wiring run too long?
Is there between 20 & 28 VAC between the blue and white low voltage wires?
NOTE: Make sure the remote switching is bypassed.
Defective low voltage circuit breaker or transformer or faulty connection in box.
Does the contactor relay close?
Contact ADP.
Defective contactor or faulty wiring.
Is there sufficient suction?
Is strainer screen or air filter clogged?
Clean or replace filter.
Are there any vacuum leaks at the vacuum?
Repair leaks.
CHECK FOR: Strainer leaks and proper operation of vacuum relief valve. Valve may be sticking open.
Are there leaks in the office plumbing?
Remove vacuum inlet line from pump. If there is good suction at pump, but little or none in system, the system is clogged or contains leaks.
Is the vacuum relief valve set too low (normal level is 10" Hg)?
Adjust to 10" Hg.
Are the drain check valves leaking excessively?
Clean valves. (A small amount of leakage is normal.)
Contact ADP.
Is there excessive vacuum?
Is vacuum relief valve filter clogged?
Replace filter.
Is the vacuum relief valve set too high (above 10" Hg)?
Adjust to 10 Hg.
Contact ADP.
Does pump run intermittently?
Does the vacuum restart when the reset is pushed?
Does thermal protector shut the pump down?
Check for adequate ventilation.
Is circuit breaker tripping?
1. Check for incorrectly sized or defective breaker.
2. Check for proper wire gauge size.
Is there between 20 & 28 volts output from the transformer?
Replace the transformer.
Does the contactor relay remain closed?
Check voltage across coil. If voltage is between 20-28V replace contactor.
Contact ADP.
A
GO TO NEXT PAGE
B

Trouble-Shooting Guide - AVD4S DryVac Vacuum


Is there fluid inside the air filter or air exhaust pipe?
YES
Has a foaming cleaner been used?
YES
Flush tank with water and start using a non foaming cleaner.
NO
Contact ADP
NOTE: Is fluid flowing inside the clear pump hoses and out the drain? Add water or turn the unit off if the pump starts to run dry.
A
B
FROM PREVIOUS PAGE
Is the tank drain clogged with debris?
YES
Remove debris from drain.
NO
Does the drain pump motor (A) start if fluid is added to the tank?
NOTE: The tank must be half full before the pump will start.
NO
YES
Does it run 10 seconds, and turn off the vacuum?
NO
Contact ADP
YES
Is fluid being pumped out the tank drain?
YES
Is the vacuum pumping an excessive amount of fluid from the operatories?
NO
Check the float switch for proper operation. See service notes for more information.
YES
Water from continuously running cuspidors may cause the unit to shutdown.
Does the drain pump start if the two black wires on the top of the control box are crossed momentarily?
YES
Is the float switch working properly? See service notes for more information.
NO
Adjust or replace float switch.
NO
Does the drain pump start if terminals 4 & 5 on the 80 sec. timer are momentarily crossed?
YES
Check connections at relay #3 and 80 sec. timer. If connections are good check relay #3.
NO
Does the drain pump work if jumped to 220 VAC.
YES
Check connections to and from the 80 sec. timer. If good replace timer.
NO
Replace drain pump.
NO
Is the pump impeller worn or broken?
YES
Replace the drain pump impeller and gaskets.
NO
Is the pump check valve clogged?
YES
Clean or replace check valve.
NO
Contact ADP
*Be sure to install both gaskets on cover plate
Installation Where Measured Voltage Is Greater Than 218V Apollo Transformer Is Required (P.N. ACA110) For Proper Operation
Disconnect Box 208V Single Phase 60 Hz Circuit With Approved Ground Required 1 Ea. Motor (Provided By Electrician)
Control Box
115VAC Receptacle (Provided By Electrician)
(20" W x 18" D x 18" H)
Roof
1 1/2" Steel Vent To Outside Of Building (Provided By Plumber)
1 1/2" Flex PVC (Provided)
(16" W x 16" D x 35" H)
1 1/2" P-Trap With 1" Air Gap (Provided By Plumber)
2" Max.
Floor Sink
6" - 12"

Service Notes:

Float Switch Description:

The float switch is located inside the PVC separation tank and can be accessed by removing the tank lid. The float switch includes a PVC mounting assembly, and a 24V mercury switch imbedded in a plastic float. The float is mounted approximately 12 inches from the bottom of the tank. The float when installed properly will have the **"RED"** arrow on the float mount pointing towards the intake/exhaust ports on bottom of tank.

During normal operation the float will turn on the drain pump for 80 seconds when the fluid level in the tank reaches the half way point. If for some reason the drain pump cannot lower the fluid level to the point where the switch contacts are opened the unit will shut down after 10 seconds and manually drain. The unit can be restarted by pressing the reset button on the front cover of the electric enclosure. The 10 second shut down and reset button are safety features; the need for their use may indicate that a problem exists in the vacuum system. **See Trouble Shooting Guide on previous page**.

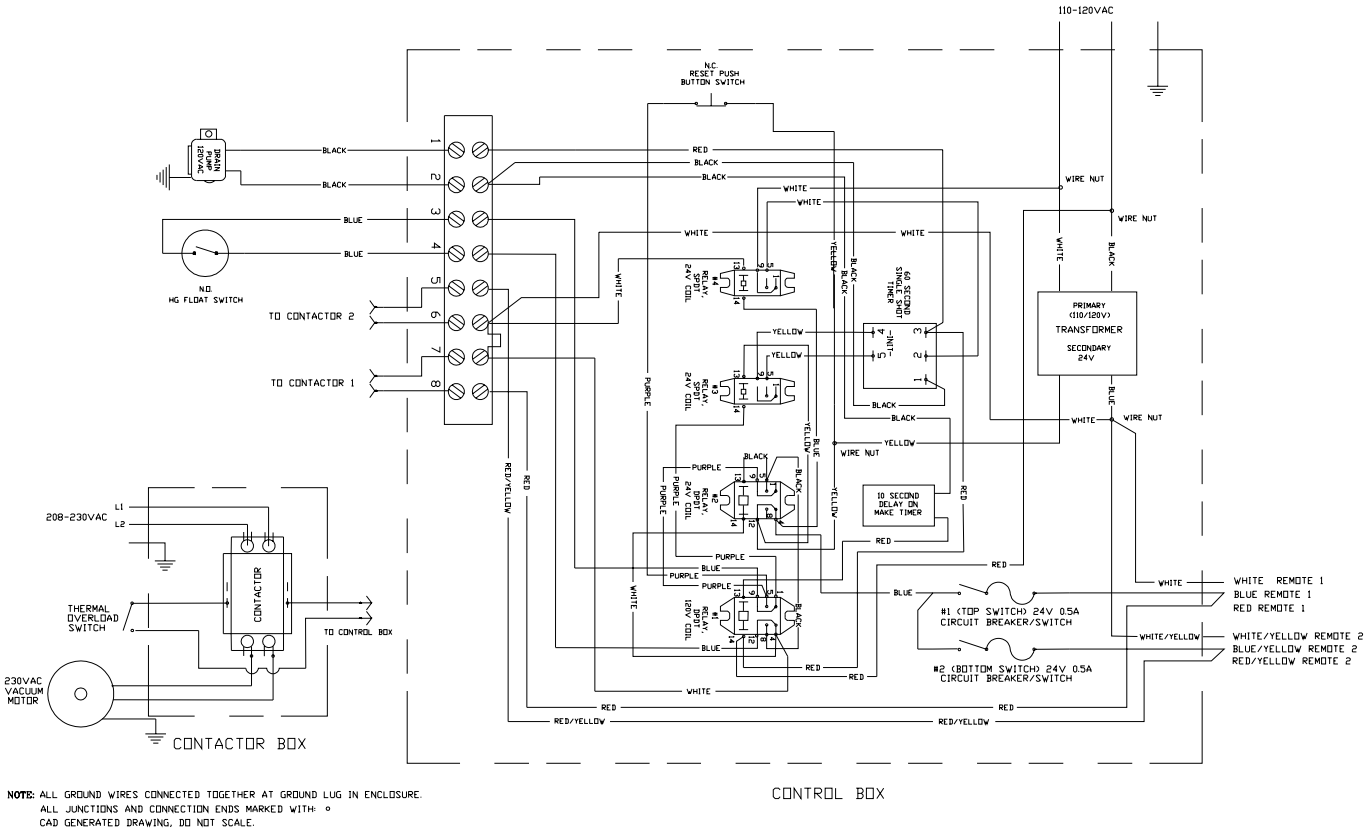
Float Switch Test Procedure:

The float switch can be checked for proper operation by following these steps:

1. Turn the unit "OFF" and allow the fluid in the PVC tank to drain out.
2. Temporarily plug the drain hose.
3. Temporarily disconnect the two gray float wires at the electrical box.
4. Connect the wires to a continuity tester or multimeter. With no fluid in the tank there should be no continuity (open circuit).
5. Add water slowly to the drain service port on the top of the tank.
6. When the water level reaches approximately half way inside the tank (use a small wooden dowel to check level) the continuity tester or multimeter will show continuity (closed circuit).
7. If the float does not pass this test, check to make sure that the "RED" arrow on the float mount is pointing toward the intake/exhaust ports on bottom of tank. If the arrow is not in the proper location turn the float mount so that it is and reset. Replace the float assembly if it fails the second test. Place a shallow pan under the float when removing it to catch any residual fluid.

Drain Pump Impeller Replacement Procedure:

1. Turn the vacuum "OFF" and allow to drain.
2. Turn the vacuum "ON" and momentarily cross the two black wires going to the float switch.
3. When the drain pump starts to run dry turn "OFF" the unit.
4. Remove the pump cover and replace the impeller and gaskets (be sure to use two gaskets) with kit #MMS80472. **Important:** Pack *petroleum jelly* around the new impeller.
5. Replace cover and restart vacuum.
6. Add water (approximately 5 1/2 gallons) to the tank until the pump starts. Stop adding water and check for leakes and proper drainage.



NOTE: ALL GROUND WIRES CONNECTED TOGETHER AT GROUND LUG IN ENCLOSURE.
ALL JUNCTIONS AND CONNECTION ENDS MARKED WITH: o
CAD GENERATED DRAWING, DO NOT SCALE.

Replacement Parts List

Description	Part Number
Contactor, 24V	ETR10460
Drain, Manifold	SVA961
Impeller and Gasket Kit	MMS80472
Filter, Vacuum Relief Valve	SVA95819
Gauge, Vacuum	PGA70416
Relay, 240VAC DPDT #1	ETR10457
Relay, 24VAC DPDT #2	ETR10459
Relay, 24VAC SPDT #3	ETR10455
Strainer, 1 1/2" FPT Vacuum Inlet	PVC50700
Switch, Circuit Breaker ON/OFF 24V	ECS10422
Twin Conversion Kit (8 User)	AVA96250

	Description	Part Number
	Switch, Float Assembly	SVA96122
	Tank, Assembly	TST92030
	Timer, 10 Seconds	EMS80505
	Timer, 80 Seconds	EMS80507
	Transformer, 115/208 24V	ETR10500
	Blower Motor Assembly	HRM10200
	Valve, Check 1/2"	PVV50656
	Valve, Check 3/4"	PVV50657
	Valve, Vacuum Relief 1"	PVV85981
New	StayClean™ Line Cleaner - 64 oz.	ASC00002

Warranty Information: 2 Year

All ADP units are thoroughly inspected and tested in accordance with rigid specifications and standards. Our products are guaranteed against any defective material and workmanship from the date of shipment; provided, that the installation, operation, and maintenance is done in accordance with ADP procedures as outlined in our Installation and Maintenance Guides. Warranty cards must be returned to ADP within ten days of installation to effect warranty. No other warranties or guarantees, expressed or implied are made.

ADP's obligation under the warranty is to provide parts for the repair or, at its option, to provide the replacement product (excluding labor). All special, incidental and/or consequential damages are excluded. We will not issue credit for complete air compressors or vacuum systems without first attempting to correct the problem in the field. Written notice of breach of warranty must be given to ADP within the warranty period. The warranty does not cove damage resulting form improper installation or maintenance, accident or misuse. The warranty does not cover damage resulting from the use of cleaning, disinfecting or sterilizing chemicals and processes. The warranty does not cover vacuum failures due to hard water deposits. Failure to follow instructions provided in ADP's Installation and Maintenance Guides may void the warranty.